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MICHAEL C. BARRETT
FULBRIGHT AND JAWORSKI L.L.P.
600 CONGRESS AVENUE, SUITE 2400
AUSTIN, TX 78701

EXAMINER	
BARTON, JEFFREY THOMAS	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/743,698	GASCOYNE ET AL.
	Examiner	Art Unit
	Jeffrey T. Barton	1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-56* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *20040716*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 12 is objected to because a method defined by the "use" of a device feature might be construed as being indefinite.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 13, and 49-51 are rejected under 35 U.S.C. 102(b) as being anticipated by Becker et al. (WO 01/14870)

Addressing claim 1, Becker et al disclose a method comprising: subjecting particles to a dielectrophoretic force using a swept frequency signal in combination with a fixed frequency signal (Page 45, lines 3-8; Figure 6F; Page 39, lines 13-26); segregating the particles into two or more zones of a surface (Page 25, lines 3-27; Page 29. lines 10-11); and attaching the particles to the surface. (Page 29, lines 10-11)

Addressing claim 13, Becker et al disclose their method comprising flow DEP-FFF. (Summary section, especially Page 13, lines 20-23)

Addressing claim 49, Becker et al disclose an apparatus comprising: a dielectrophoretic field flow fractionator that applies a dielectrophoretic force to separate

particles (e.g. cells) into two or more zones (Figure 13; Page 25, lines 3-27); and a dielectrophoretic collector coupled to the fractionator that attaches the particles to the surface. (Page 29, lines 4-11) The term "smear" can be applied to such attachment of cells to a surface.

Addressing claim 50, Becker et al disclose the smear comprising a pap smear. (Page 28, lines 11-15)

Addressing claim 51, Becker et al disclose the fractionator and collector forming an integral unit. (Page 28, line 22 - Page 29, line 11)

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 2-6, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al. (WO 01/14870).

Addressing claims 2-6:

Becker et al disclose a method as described above in addressing claim 1.

Relevant to claim 2, Becker et al disclose variation of electrode width and spacing that would result in varying field intensity along the length of the device (e.g. Page 11, lines 10-17), application of plural simultaneous electric fields of fixed or swept frequency (Page 45, lines 3-8; Page 7, lines 3-23), transitioning between zones of different electrical signals and electrode or channel geometry (Page 29, lines 7-10), and flexibility in operation and optimization of AC signal characteristics (Page 13, lines 10-23)

Becker et al do not explicitly disclose methods comprising the swept frequency signal falling from maximum to minimum intensity along a length of a surface, and the fixed frequency signal falling from maximum to minimum intensity in the opposite direction; linear or non-linear intensity variation; intensity controlled by electrode bus width, or non-zero minimum intensities of either signal.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify to method of Becker et al to provide a swept-frequency signal falling in intensity along a length of the chamber as a fixed-frequency signal rises in intensity along the same length, because Becker et al teach all device configurations needed to provide such a pattern, and it would provide a smooth transition between the zones of different separation parameters Becker et al suggest. (Page 29, lines 7-10)

It would also have been obvious to provide linear or non-linear variation in intensity, because a linear variation would be the simplest pattern to apply, but the non-linear variation could provide greater or lesser periods of combined field influence on the particles, as dictated by the needs of the given separation.

It would also have been obvious to vary signal intensity by varying electrode bus thickness, because it would be straightforward to prepare a suitable lithographic mask, and it is known that resistance and electric field strength are directly influenced by the cross section of the conductor.

It would also have been obvious to use non-zero intensity minima in cases where the continued influence of both fields is desirable for a particular separation.

Addressing claims 44 and 45:

Becker et al disclose an apparatus comprising: a surface and electrodes near the surface (Figure 13), multiple signal generators for providing swept or fixed frequency signals (Page 13, lines 11-13), electrodes of variable width and spacing that would result in varying field intensity along the length of the device (e.g. Page 11, lines 10-17), application of plural simultaneous electric fields of fixed or swept frequency (Page 45, lines 3-8; Page 7, lines 3-23), transitioning between zones of different electrical signals and electrode or channel geometry (Page 29, lines 7-10), and flexibility in operation and optimization of AC signal characteristics (Page 13, lines 10-23); wherein the device can apply the signals to provide a dielectrophoretic force for particle separation. (Page 45, lines 3-8)

Relevant to claim 45, Becker et al disclose integral generators. (Page 13, lines 11-13)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify to apparatus of Becker et al to configure the signal generators to apply a swept-frequency signal falling in intensity along a length of the chamber and a fixed-frequency signal rises in intensity along the same length, because Becker et al teach all device configurations needed to provide such a pattern, and it would provide a smooth transition between the zones of different separation parameters Becker et al suggest. (Page 29, lines 7-10)

8. Claims 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) in view of Seul et al.

Becker et al disclose a method as described above in addressing claim 1. They also disclose the possibility of including non-conducting elements to modify the flow profile for improved particle discrimination, (Page 29, lines 1-6) separation of particles using a flow, a cross-flow, and a dielectrophoretic force that opposes a force associated with the cross-flow. (Page 56, line 10 - Page 57, line 14; Page 58, lines 5-13)

Relevant to claim 10, Becker et al disclose dielectrophoretic force caused by electrodes near a dielectric substrate having openings. (Figure 13; both substrates have openings)

Relevant to claim 11, Becker et al disclose dielectrophoretic force caused by current passing through an opening in a dielectric barrier. (Figure 13; current must pass through either the substrate or the spacer, both are dielectric)

Becker et al do not explicitly disclose this method as "filtering", although its function is similar.

Seul et al disclose a method using a dielectrophoretic device with filtering elements within the chamber, the method also using flow and crossflow in opposition to dielectrophoretic forces. (Figure 9a; Column 19, line 45 - Column 20, line 15)

Relevant to claim 8, Seul et al illustrate their method involving a substantially perpendicular crossflow. (Figure 9a)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Becker et al by performing it within a

chamber that comprises filtering elements, as taught by Seul et al, because it would provide an additional mode of separation to assist in discriminating between similar particles.

Regarding claim 8, it would also have been obvious to provide a substantially perpendicular crossflow, as taught by Seul et al, because it would provide the greatest effect for a given crossflow. Regarding claim 9, having simultaneous adjustable flow and crossflow is functionally equivalent to having non-perpendicular crossflow, as identical flow profiles within the chamber are attainable.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) in view of Giddings et al.

Becker et al disclose a method as described above in addressing claim 1. Additionally, they disclose the possibility of including non-conducting elements to modify the flow profile for improved particle discrimination (Page 29, lines 1-6) and sedimentation of separated particles (Page 14, lines 5-9)

Becker et al do not explicitly disclose a method using a physical barrier to confine particles in a particular zone.

Giddings et al disclose a dielectrophoretic method using collection ports defined at valleys in a corrugated surface (i.e. periodic barriers) to confine particles in discrete zones. (Abstract, Figure 1)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Becker et al by performing it within a

chamber that comprises collection ports positioned at valleys defined by periodic physical barriers, as taught by Giddings et al, because it would provide a relatively simple method of separating particles based on size.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) in view of Arnold.

Becker et al disclose a method as described above in addressing claim 1.

Becker et al do not explicitly disclose a method in which growth of the particles (i.e. cells) on the surface is promoted.

Arnold discloses a dielectrophoretic separation method for cells in which growth of the cells within the chamber is promoted by the composition of the liquid medium. (Column 4, lines 35-37) Some growth would occur at the chamber surfaces.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Becker et al by promoting growth of the separated cells, as taught by Arnold, because it would provide enhanced ability to detect dilute cell species, enhancing process sensitivity.

11. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) in view of Cheng et al.

Becker et al disclose a method as described above in addressing claim 1. They also disclose using a computer to control the applied voltage. (Page 45, lines 16-21)

Becker et al do not explicitly disclose a method in which the applied signals are automatically adjusted as a function of the conductivity of the suspending medium.

Cheng et al disclose general automation of microfluidic chip-based biological analyses, including dielectrophoretic manipulation of cells and voltage control. (Abstract, Paragraphs 0004 and 0057-0059)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Becker et al by automating voltage control, as taught by Cheng et al, because it would reduce the manual labor required for analysis. Furthermore, it would also be obvious to control the voltage as a function of medium conductivity because it is a critical parameter linked to resistive heating of the device, which could potentially degrade the sample.

12. Claims 16-18, 20-25, 28-34, 42, and 52-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) in view of the website of Tripath Imaging, Inc. (March 5, 2002).

Addressing claims 16-18, 20-25, 28-34, and 42:

Relevant to claim 16, Becker et al disclose a method comprising: subjecting particles of a sample to dielectrophoretic force to segregate the particles into two or more zones of a surface (Page 45, lines 3-8; Figure 6F; Page 39, lines 13-26; Page 29, lines 10-11); and attaching the particles to the surface, defining a segregated smear.

(Page 29, lines 10-11) They also suggest the use of their device and method to perform pap smear analyses. (Page 28, lines 11-15)

Relevant to claim 18, Becker et al disclose attaching particles to the surface by dielectrophoretic force. (Page 29, lines 10-11)

Relevant to claim 20, Becker et al disclose attaching particles to the surface by allowing particles to settle. (Page 14, lines 5-9)

Relevant to claim 21, Becker et al disclose the particles comprising cells. (Page 3, line 24 - Page 4, line 2)

Relevant to claim 22, Becker et al disclose the smear comprising a pap smear. (Page 28, lines 11-15)

Relevant to claims 23-25, Becker et al disclose the dielectrophoretic force arising from simultaneous application of programmed voltage signals of different frequencies (Page 45, lines 3-8); application of frequencies exhibiting one or more DEF-FFF and trapping phases (Page 7, line 3 - Page 11, line 17; Page 13, lines 10-23, Page 29, lines 10-11); and generation of the force by electrodes coupled to the surface. (Figure 13)

Relevant to claim 28, Becker et al disclose the separation of particles into distinct bands. (Page 3, line 14 - Page 4, line 2)

Relevant to claim 29, Becker et al disclose using a swept frequency signal in combination with a fixed frequency signal. (Page 45, lines 3-8; Figure 6F; Page 39, lines 13-26)

Relevant to claim 30, Becker et al disclose variation of electrode width and spacing that would result in varying field intensity along the length of the device (e.g.

Page 11, lines 10-17), application of plural simultaneous electric fields of fixed or swept frequency (Page 45, lines 3-8; Page 7, lines 3-23), transitioning between zones of different electrical signals and electrode or channel geometry (Page 29, lines 7-10), and flexibility in operation and optimization of AC signal characteristics (Page 13, lines 10-23)

Relevant to claim 42, Becker et al disclose separation of particles by DEP-FFF. (Summary section, especially Page 13, lines 20-23)

Relevant to claim 16, Becker et al do not explicitly disclose fixing or staining the segregated smear.

Relevant to claims 30-34, Becker et al also do not explicitly disclose methods comprising the swept frequency signal falling from maximum to minimum intensity along a length of a surface, and the fixed frequency signal falling from maximum to minimum intensity in the opposite direction; linear or non-linear intensity variation; intensity controlled by electrode bus width, or non-zero minimum intensities of either signal.

Relevant to claim 16, the website of Tripath Imaging, Inc. (March 5, 2002) disclosed kits and reagents, including fixatives and stains for performing pap smear analyses. (Surepath™ test pack, Prepstain™ slide processor)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Becker et al including steps of fixing and staining the pap smear sample, as taught by the Tripath website, because they are standard steps in pap smear analysis.

Relevant to claim 30, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify to method of Becker et al to provide a swept-frequency signal falling in intensity along a length of the chamber as a fixed-frequency signal rises in intensity along the same length, because Becker et al teach all device configurations needed to provide such a pattern, and it would provide a smooth transition between the zones of different separation parameters Becker et al suggest. (Page 29, lines 7-10)

Relevant to claims 31 and 32, it would also have been obvious to provide linear or non-linear variation in intensity, because a linear variation would be the simplest pattern to apply, but the non-linear variation could provide greater or lesser periods of combined field influence on the particles, as dictated by the needs of the given separation.

Relevant to claim 33, it would also have been obvious to vary signal intensity by varying electrode bus thickness, because it would be straightforward to prepare a suitable lithographic mask, and it is known that resistance and electric field strength are directly influenced by the cross section of the conductor.

Relevant to claim 34, it would also have been obvious to use non-zero intensity minima in cases where the continued influence of both fields is desirable for a particular separation.

Addressing claims 52-54:

Becker et al disclose an apparatus described in addressing claim 49 in paragraph 3 above.

Becker et al do not explicitly disclose a machine reader configured to evaluate particles (Claim 52); a fixing stage and staining stage coupled to the collector (Claim 53); or fixing and staining stages coupled to the collector to form an integral unit. (Claim 54)

The website of Tripath Imaging, Inc. (March 5, 2002) disclosed an automated diagnostic system allowing integrated sample preparation, staining, and screening, that would correspond to these claimed embodiments. (Focalpoint™ slide profiler)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Becker et al by coupling the collector to an automated, integrated workstation that performs fixation, staining, and screening, as taught by the Tripath website, because it would decrease operator labor and increase reliability of analysis.

13. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) and the website of Tripath Imaging, Inc. (March 5, 2002) as applied to claim 16 above, and further in view of Coster et al.

Becker et al (WO 01/14870) and the Tripath website disclose a combined method as described above in addressing claim 16.

Neither Becker et al nor the Tripath website disclose using an adhesive to bind cells to the surface.

Coster et al disclose a dielectrophoretic separation method involving binding of cells to the surface of their device using an adhesive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined method of Becker et al and the Tripath website by using an adhesive to hold cells to the surface, as taught by Coster et al, because it would help prevent sample loss without requiring electrical power.

14. Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) and the website of Tripath Imaging, Inc. (March 5, 2002) as applied to claims 16 and 25 above and further in view of Becker et al. (US 5,858,192)

Becker et al (WO 01/14870) and the Tripath website disclose a combined method as described above in addressing claims 16 and 25. Becker et al also disclose flexibility in electrode shape within their devices and methods. (Page 6, lines 7-22; Page 29, lines 6-10)

Neither Becker et al (WO 01/14870) nor the Tripath website explicitly disclose a method in which the electrodes are configured in a spiral (Claim 26), or wherein the zones are concentric circular zones. (Claim 27)

Becker et al (US 5,858,192) disclose a dielectrophoretic separation device comprising spiral electrodes, and methods for its use. (Abstract, Figure 2B) They also disclose the zones wherein the particles attach to the surface being concentric circular zones. (Figures 5 and 6)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined method of Becker et al (WO 01/14870) and the Tripath website by using spiral-shaped electrodes that cause particles to be disposed in concentric zones, as taught by Becker et al (US 5,858,192), because Becker et al (WO 01/14870) disclosed flexibility in chamber and electrode geometry, and it would facilitate concentration of the cells directed to the center of the device.

15. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) and the website of Tripath Imaging, Inc. (March 5, 2002) as applied to claim 29 above and further in view of Cheng et al.

Becker et al and the Tripath website disclose a combined method as described above in addressing claim 29. Becker et al also disclose using a computer to control the applied voltage. (Page 45, lines 16-21)

Neither Becker et al nor the Tripath website explicitly disclose a method in which the applied signals that cause dielectrophoresis are automatically adjusted as a function of the conductivity of the suspending medium.

Cheng et al disclose general automation of microfluidic chip-based biological analyses, including dielectrophoretic manipulation of cells and voltage control. (Abstract, Paragraphs 0004 and 0057-0059)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined method of Becker et al and the Tripath website by automating voltage control, as taught by Cheng et al, because it would

reduce the manual labor required for analysis. Furthermore, it would also be obvious to control the voltage as a function of medium conductivity because it is a critical parameter linked to resistive heating of the device, which could potentially degrade the sample.

16. Claims 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) and the website of Tripath Imaging, Inc. (March 5, 2002) as applied to claim 16 above and further in view of Seul et al.

Becker et al and the Tripath website disclose a combined method as described above in addressing claim 16. Becker et al also disclose the possibility of including non-conducting elements to modify the flow profile for improved particle discrimination, (Page 29, lines 1-6) separation of particles using a flow, a cross-flow, and a dielectrophoretic force that opposes a force associated with the cross-flow. (Page 56, line 10 - Page 57, line 14; Page 58, lines 5-13)

Relevant to claim 39, Becker et al disclose dielectrophoretic force caused by electrodes near a dielectric substrate having openings. (Figure 13; both substrates have openings)

Relevant to claim 40, Becker et al disclose dielectrophoretic force caused by current passing through an opening in a dielectric barrier. (Figure 13; current must pass through either the substrate or the spacer, both are dielectric)

Becker et al do not explicitly disclose this method as "filtering", although its function is similar. The Tripath website discloses no such filtering methods.

Seul et al disclose a method using a dielectrophoretic device with filtering elements within the chamber, the method also using flow and crossflow in opposition to dielectrophoretic forces. (Figure 9a; Column 19, line 45 - Column 20, line 15)

Relevant to claim 37, Seul et al illustrate their method involving a substantially perpendicular crossflow. (Figure 9a)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined method of Becker et al and the Tripath website by performing it within a chamber that comprises filtering elements, as taught by Seul et al, because it would provide an additional mode of separation to assist in discriminating between similar particles.

Regarding claim 8, it would also have been obvious to provide a substantially perpendicular crossflow, as taught by Seul et al, because it would provide the greatest effect for a given crossflow. Regarding claim 9, having simultaneous adjustable flow and crossflow is functionally equivalent to having non-perpendicular crossflow, as identical flow profiles within the chamber are attainable.

17. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870), the website of Tripath Imaging, Inc. (March 5, 2002), and Seul et al as applied to claim 36 above and further in view of Giddings et al.

Becker et al, the website of Tripath Imaging, Inc., and Seul et al disclose a method as described above in addressing claim 36. Additionally, Becker et al disclose the possibility of including non-conducting elements to modify the flow profile for

improved particle discrimination (Page 29, lines 1-6) and sedimentation of separated particles (Page 14, lines 5-9)

Becker et al do not explicitly disclose a method using a physical barrier to confine particles in a particular zone.

Giddings et al disclose a dielectrophoretic method using collection ports defined at valleys in a corrugated surface (i.e. periodic barriers) to confine particles in discrete zones. (Abstract, Figure 1)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Becker et al by performing it within a chamber that comprises collection ports positioned at valleys defined by periodic physical barriers, as taught by Giddings et al, because it would provide a relatively simple method of separating particles based on size.

18. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) and the website of Tripath Imaging, Inc. (March 5, 2002) as applied to claim 16 above and further in view of Arnold.

Becker et al and the Tripath website disclose a combined method as described above in addressing claim 16.

Neither Becker et al nor the Tripath website explicitly disclose a method in which growth of the particles (i.e. cells) on the surface is promoted.

Arnold discloses a dielectrophoretic separation method for cells in which growth of the cells within the chamber is promoted by the composition of the liquid medium. (Column 4, lines 35-37) Some growth would occur at the chamber surfaces.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Becker et al by promoting growth of the separated cells, as taught by Arnold, because it would provide enhanced ability to detect dilute cell species, enhancing process sensitivity.

19. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) in view of Seul et al.

Becker et al disclose an apparatus as described above in addressing claim 44. They also disclose the possibility of including non-conducting elements to modify the flow profile for improved particle discrimination, (Page 29, lines 1-6) separation of particles using a flow, a cross-flow, and a dielectrophoretic force that opposes a force associated with the cross-flow. (Page 56, line 10 - Page 57, line 14; Page 58, lines 5-13)

Becker et al do not explicitly disclose a filter coupled to the surface.

Seul et al disclose a dielectrophoretic device with filtering elements within the chamber, coupled to a surface of the device, wherein particles are subjected to flow and crossflow in opposition to dielectrophoretic forces. (Figure 9a; Column 19, line 45 - Column 20, line 15) These filtering elements are disclosed as oxide grown from the surface that comprises the electrodes. (Column 19, lines 45-54)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Becker et al by providing the chamber with filtering elements, as taught by Seul et al, because it would provide an additional mode of separation to assist in discriminating between similar particles.

20. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (WO 01/14870) in view of Giddings et al.

Becker et al disclose an apparatus as described above in addressing claim 44. Additionally, they disclose the possibility of including non-conducting elements to modify the flow profile for improved particle discrimination (Page 29, lines 1-6) and sedimentation of separated particles (Page 14, lines 5-9)

Becker et al do not explicitly disclose a method using a physical barrier to confine particles in a particular zone.

Giddings et al disclose a dielectrophoretic device comprising collection ports defined at valleys in a corrugated surface (i.e. periodic barriers) to confine particles in discrete zones. (Abstract, Figure 1)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Becker et al by providing the chamber with collection ports positioned at valleys defined by periodic physical barriers, as taught by Giddings et al, because it would provide a relatively simple method of separating particles based on size.

21. Claims 55 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over the website of Tripath Imaging, Inc. (March 5, 2002) in view of Becker et al. (WO 01/14870)

The website of Tripath Imaging, Inc. (March 5, 2002) disclosed kits comprising fixing agents and pap smear staining agents. (Prepstain™ slide processor)

The website of Tripath Imaging, Inc. did not disclose a surface comprising an electrode array for applying dielectrophoretic force to particles.

Becker et al disclose a device comprising a surface comprising an array of electrodes adapted to subject particles to dielectrophoretic force to segregate the particles into two or more zones. (Figure 13)

It would have been obvious to modify the kits of Tripath Imaging, Inc. to include surfaces (i.e. slides) comprising electrodes configured for operation in the device of Becker et al because it would provide a supply of the needed consumable/disposable items for numerous pap smear analyses, as contemplated by Becker et al. (Page 28, lines 11-15)

Conclusion

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Jeffrey Barton, whose telephone number is (571) 272-1307. The examiner can normally be reached Monday-Friday from 8:30 am – 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached at (571) 272-1342. The fax number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at (866) 217-9197 (toll-free).

JTB
October 19, 2004

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700